

Please replace the paragraphs beginning on page 2, line 20, and ending on page 2, line 25, with the following rewritten paragraphs:

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measuring a change in a force acting on the cap as distal ends of threads on the cap and the vessel contact each other during the relative rotation of both threads;

a<sup>2</sup> and detecting an incipient position of a meshing engagement where the distal ends of both threads contact on the basis of the change in the acting force.

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Please replace the paragraphs beginning on page 3, line 12, and ending on page 3, line 22, with the following rewritten paragraphs:

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and control means for controlling the rotation of the motor in response to a result of a measurement from the measuring means and an angle signal from the angle detecting means;

a<sup>3</sup> the control means being arranged such that in the course of a descent of the capping head to an elevation where a clamping of the cap is to be initiated, it causes the capping head to rotate either forwardly or reversely with respect to the clamping direction to cause distal ends of both threads on the cap and the vessel to contact each other, the control means detecting an incipient position of a meshing engagement between both threads where their distal ends contact each other on the basis of a change in the force acting on the cap.

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Please replace the paragraph beginning on page 4, line 24, and ending on page 4, line 25, with the following rewritten paragraph:

ap Fig. 9 is an illustration of a cap 5 before it is threadably engaged with a vessel 2 according to a third embodiment of the invention;

Please replace the paragraph beginning on page 5, line 13, and ending on page 5, line 14, with the following rewritten paragraph:

as Fig. 15 is a front view of the essential parts of a fifth embodiment of the invention; and

Please replace the paragraphs beginning on page 6, line 7, and ending on page 6, line 22, with the following rewritten paragraphs:

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a The capping head 6 includes a chuck 7, which is known in itself, for detachably holding the cap 5 under pneumatic pressure, and a pair of upper and lower splined shafts 8a, 8b which are coupled to the chuck 7. The splined shafts 8a, 8b are mechanically coupled to a motor 9, the operation of which is in turn controlled by a controller 11. Thus, when the motor 9 is set in motion to rotate the splined shafts 8a, 8b and the chuck 7 in a direction to clamp the cap, the cap 5, which is held by the chuck 7, is threadably engaged around the mouth of the vessel 2.

Torque measuring means 12, which measures a force acting upon the cap 5 held by the capping head 6 as a rotational load, and an encoder 13, acting as angle detecting means, are connected to the motor 9. In this manner, when the motor 9 is set in motion, an output torque from the motor 9 is detected by the torque measuring means 12, with a result of measurement being fed to the controller 11. At the same time, an angular position of rotation of the motor 9 is detected by the encoder 13, which feeds an angle signal to the controller 11.

Please replace the paragraph beginning on page 8, line 6, and ending on page 8, line 13, with the following rewritten paragraph:

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a 7  
Specifically, referring to Fig. 3, the cam surface of the elevating cam is formed with a descent stop zone A toward the left end, as viewed in Fig. 3, where the capping head 6 ceases to descend and maintains the same elevation while it travels. The descent stop interval A is provided in the course of a descent of the capping head 6 to the elevation of the clamping zone B at a location where the cap 5 is fitted over the vessel 2, but before the female threads 5a on the cap 5 are urged against the male threads 2a on the vessel 2 by the spring 14.

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Please replace the paragraphs beginning on page 9, line 1, and ending on page 10, line 4, with the following rewritten paragraphs:

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a 8  
In the present embodiment, while the capping head 6 ceases its descent in the descent stop zone A, the torque measuring means 12 detects an output torque from the motor 9 while the controller 11 causes the motor 9 to rotate through one revolution in either a forward or reverse direction, thus causing the cap 5 held by the chuck 7 on the capping head 6 to rotate through one revolution either forwardly or reversely.

When the cap 5 is rotated through one revolution, it follows that the lower end 5a- of the female threads 5a on the cap 5 once abuts against the upper end 2a- of the male threads 2a on the vessel 2 during such rotation, and at the instant of abutment, an output torque or a rotational load which has a maximum magnitude during the one revolution rotation of the cap 5 is measured. When a result of this measurement is input to the controller 11, the latter recognizes a prevailing angular position by means of the encoder 13. Fig. 4 shows a relationship between the output torque detected by the torque

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measuring means 12 with respect to the angular position of rotation of the motor 9 or the angular position of rotation of the cap 5 and the capping head 6 detected by the encoder 13 during the time the motor 5 causes the cap 5 to rotate through one revolution in the clamping direction. When the lower end 5a- of the female threads 5a on the cap 5 abuts against the upper end 2a- of the female threads 2a on the vessel 2, there occurs a rapid increase in the output torque as indicated by a peak in Fig. 4. This position represents the incipient position P of meshing engagement. It is to be noted that the torque measuring means 12 is designed to measure the magnitude of the current which is supplied to the motor 9. Thus, the magnitude of the current supplied to the motor 9 increases when there is a rotational load. This is indirectly determined as a change in the output torque, and the incipient position of meshing engagement P is detected as an angular position of rotation where the magnitude is equal to or greater than a given value.

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Please replace the paragraphs beginning on page 11, line 25, and ending on page 12, line 16, with the following rewritten paragraphs:

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It is to be understood that the incipient position of meshing engagement P merely represents a reference position, and if the configuration of the threads on the vessel and/or cap is modified, such position moves back and forth. To achieve a required winding angle, an optimum winding angle, which is referenced to the incipient position of meshing engagement which is determined for a particular combination of a vessel and a cap which are to be capped together, is previously determined, and is chosen as a given angle  $\theta_2$ .

Thus it will be seen that in the present embodiment, the incipient position of meshing engagement P is detected in terms of a change in an output torque from the torque

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a measuring means 12, and the cap 5 is rotated through the given angle of rotation  $\theta$  2 as referenced to the incipient position of meshing engagement P thus determined, thus causing it to be threadably engaged with the vessel 2. This allows the incipient position of meshing engagement P to be detected accurately, and a subsequent clamping operation takes place always uniformly as the cap 5 is capped to assure a capping operation of a high precision.

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Please replace the paragraphs beginning on page 15, line 21, and ending on page 16, line 11, with the following rewritten paragraphs:

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a At this time, a rotational speed of the motor 9 is chosen to be such that the cap rotates at least through one revolution during the time the cap 5 descends in the vertical direction by an amount corresponding to the width of a single one of the male threads 2a on the cap 2 under the influence of the elevating cam. The rotational speed of the motor 9 in the rapid rotation zone A is higher than the rotational speed which is used during the capping operation (the speed with which the capping head 6 is caused to descend under the influence of the elevating cam is greater than the speed with which the cap 5 descends while rotating in order to prevent the vessel 2 from being lifted up at the commencement of the clamping operation).

As a consequence, it is assured that the lower extremity 5a- of the female threads 5a on the cap 5 abuts against the top end 2a- of the male threads 2a on the vessel 2 during the rotation through one revolution, as indicated in Fig. 9, whereby an increase in the output torque is detected by the torque measuring means 12 (see P in Fig. 11). The position P represents a position where the meshing engagement is initiated.

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Please replace the paragraph beginning on page 16, line 17, and ending on page 17, line 2, with the following rewritten paragraph:

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a<sup>11</sup> The rotation of the cap 5 is ceased for the following reason: in this embodiment, depending on the elevation of the cap 5 when it abuts against the male threads 2a on the vessel 2, it is uncertain whether the female threads 5a on the cap 5 are located on the upside or downside of the male threads 2a on the vessel 2 for threadable engagement. If the female threads 5a on the cap 5 are located on the underside of the male threads 2 on the vessel 2 to proceed into the threadable engagement, the capping head 6 is not yet descended enough, whereby the vessel 2 may be lifted up. However, because the capping head 6 continues to descend to be situated in the clamping zone B, the female threads 5a on the cap 5 can be urged against the male threads 2a on the vessel 2.

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Please replace the paragraphs beginning on page 18, line 20, and ending on page 19, line 4, with the following rewritten paragraphs:

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a<sup>12</sup> When the cap 5 is rotated in the descent deceleration zone A, it is assured that the lowest extremity on the cap 5 abuts against the top end 2a- of the male threads 2a on the vessel 2, allowing an increase in the output to be detected upon abutment (see P in Fig. 14). This defines the incipient position of meshing engagement P.

When the controller 11 detects the abutment of the lowest extremity 5a- of the female threads 5a on the cap 5 against the top end 2a- of the male threads 2a on the vessel 2 in terms of the increase in the output torque, it increases the descending speed of the capping head 6 until it descends to the clamping zone B, thus urging the female threads 5a on the cap 5 against the male threads 2a on the vessel 2. The